Variations on a Theme

Objectives
Students will: 1) review the classification system for categorizing animals as it relates to Pacific salmon and steelhead, 2) describe similarities and differences between Chinook (king) salmon and steelhead, 3) create and use a grid scale and draw a life size salmon or steelhead.

Curricular Areas
Math, Science, Language Arts, Art

California Content Standards
GRADES 3-8

Science

3rd Life 3 a, b, c; Investigation 5 e
4th Life 3 b; Investigation 6 a, c, e
5th Investigation 6 g, h
6th Ecology 5 c, d, e; Investigation 7 c
7th Life Sciences 2 b, 3a, d, e; Investigation 7 d

English Language Arts

3rd Reading 2.2, 0.3, 0.4, 0.5, 6.1; Writing 1.1, 0.3, 0.4, 2.2; Written/Oral 1.1, 0.2, 0.3, 0.4; Speaking 1.1, 0.5, 0.6, 0.4, 0.8, 2.1, 0.4
4th Writing 1.1, 0.2, 0.3, 0.5, 0.7, 0.8, 0.10; 2.1, 2.3; Written/Oral 1.0; Listen/Speak 1.0; Speaking 2.0
5th Read 1.0, 2.0; Writing 2.0; Written/ Oral 1.0; Listen/ Speak 1.0, 2.0
6th Read 1.0, 2.0; Writing 2.0; Written/Oral 1.0; Listen/ Speak 1.0, 2.0
7th Read 2.0; Writing 1.0, 2.0; Listen/Speak 1.0, 2.0
8th Writing 1.0, 2.0; Speaking 1.0, 2.0

Math

3rd Reasoning 1.0, 3.0
4th Data 1.0, Reasoning 1.0, 2.0
5th Data 1.0, Reasoning 1.0, 2.0
6th Algebra 2.0, Reasoning 1.0, 2.0
7th Algebra 3.0, Measurement 1.0, Data 1.0, Reasoning 1.0, 2.0

Method
Students will use a Venn diagram as a mental organizer when comparing the two types of fish. Students use computational, graphing and measuring techniques to draw life size replicas of either a salmon or steelhead. A true or false game will review the information about the species.

Materials
- Time to complete: (2-3) 50-minute class periods
- Copies of *Salmon & Steelhead Fact Sheet*
- Copies of Venn diagram handout
- Butcher paper (about 4 feet per student)
- Crayons or marking pens
- Grid paper, rulers
- Newspaper, stapler, string

Background
In the scientific community, living organisms are grouped into categories based on similar characteristics. Taxonomy is the branch of science by which plants and animals are classified. The kingdom group for animals is subdivided into phylums. The phylums are divided into class, order, family, genus and species. The division is based on shared characteristics and move from general to more specific. In the upper categories, species share many characteristics; while at the genus level, there are generally only a few species. In other words, the hierarchy of scientific names is used to identify like individuals. An easy way to remember these categories is to think of the phrase: "**P**eople **C**ross **O**ver **F**ences **G**oing **S**outh." The basic unit of the naming system is the genus and the species name. For Pacific salmon and trout, the genus is *Oncorhynchus*.

Scientific Name	**Common Name**
Pacific Salmon	
Oncorhynchus tshawytscha	Chinook or king salmon
Oncorhynchus kisutch	coho or silver salmon
Oncorhynchus nerka	red salmon, sockeye, or kokanee
Oncorhynchus keta	chum or dog salmon
Oncorhynchus gorbuscha	pink or humpback
Trout	
Oncorhynchus mykiss	steelhead or rainbow trout

Some of the characteristics shared by salmon and trout are: the capacity to be anadromous; fine (small) scales; an adipose fin (small, fleshy fin on the back just before the tail fin); relatively large eggs; strong swimmers; the need for cooler, highly oxygenated waters; and spawning males that develop a distinctly hooked lower jaw (kype).

Steelhead has recently been reclassified from the genus Salmo to Oncorhynchus. Atlantic salmon are the genus Salmo. Studies show steelhead is more closely related

to Pacific salmon. A steelhead is a rainbow trout that has spent part of it's adult life in the ocean.

All five species of Pacific salmon have been caught in California's river systems; however, only king, steelhead, and to a lesser extent, coho, are ordinarily found in California.

Procedure

Part 1

1. Introduce the word taxonomy and briefly review the classification of Pacific salmon and trout.
2. Ask students if they are familiar with the Venn diagram format. As a review, create one on the board and have students provide the information to compare two familiar subjects (perhaps a dog and a cat).
3. Provide students a copy of the *Salmon & Steelhead Fact Sheet* and a Venn diagram. Each student should complete a Venn diagam using the Fact Sheet.
4. Have the class discuss their diagrams by creating a large class Venn diagram on the board.

Part II

1. Provide students with grid paper. Explain that they will learn how to use grids to draw a life size Chinook salmon or steelhead.
2. To learn how to use the grid, students should draw an outline of their hand on the grid paper. Once the outline of the hand is finished, have students make a grid on larger paper (flip chart paper or butcher paper). The grid squares on the large paper should be three to four times bigger than the squares on the smaller grid paper. Once the students have a larger grid made, have students transfer the small drawing of their hand to the larger paper. Number the squares on both pieces of paper; transfer the drawing by matching the numbers of the squares (Diagram 1).
3. Students will use the same method to draw the fish. First, have students copy the picture of either the salmon or steelhead from Diagram 2 or Diagram 3 onto grid paper. Using this picture, determine the scale of the copy to create a two foot fish. This will determine the size for the larger grid. Example, if the 4 inch copy is placed on a one inch grid, each one inch squares would represent six inches. Therefore, 4-6 inch squares could be used to transfer the fish, creating a two foot representation.
4. Create the larger grid on butcher paper to produce a two foot fish. The fish may be cut out (double the paper to create two copies) and colored using the species information page. Place the two cut-out fish together and staple the perimeter edges, leaving an opening large enough to stuff crumpled newspaper into the interior, and staple closed. Attach string to hang fish.

Part III

1. To review the similarities of Chinook salmon and steelhead, students will play a true-false game called "The Salmon & Steelhead Game."
2. Divide the class into two equal groups. Have the groups face each other approximately eight feet apart. Place boundary lines behind each group approximately 20 feet back.
3. One group is designated as the salmon, the other as the steelhead. The leader stands at the end of the two lines and reads a true or false statement, for example:
   - If the statement is true, the salmon chase the steelhead across the back boundary line behind the steelhead, trying to tag the steelhead.
   - If the statement is false, the steelhead chase the salmon across the boundary line behind the salmon, trying to tag the salmon.
   - All participants should only use one hand in tagging. If a participant in the opposite group is tagged, then they move over to that group.
   - After everyone lines up again, another statement is read and the game continues.

Extension

1. Have students write a brief report on how Chinook and steelhead use their habitat differently. (They have different spawning sites, steelhead need streams that have cool, fresh water throughout the year.)
2. Discuss with students the question of who would need to know the difference between Chinook and steelhead. (An angler would need to know because of different fishing regulations for each. Also, a scientist would need to know in order to study the fish or their environment. Finally , a planner should know in order to regulate the stream).

Evaluation *Refer to Venn Diagram*

- Describe at least three similarities of salmon and steelhead.
- Describe at least three differences between salmon

Venn diagram and fact sheets adapted with permission from *Some Things Fishy, A Teacher's Guide for the Feather River Fish Hatchery,* published by the CA Department of Water Resources, Office of Education.

Enlarge a Drawing by Using a Grid

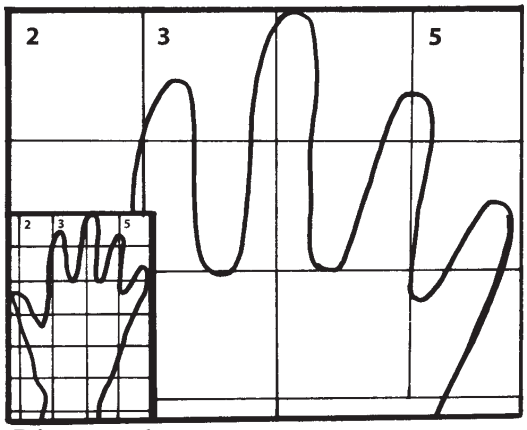


Diagram 1

Chinook Salmon

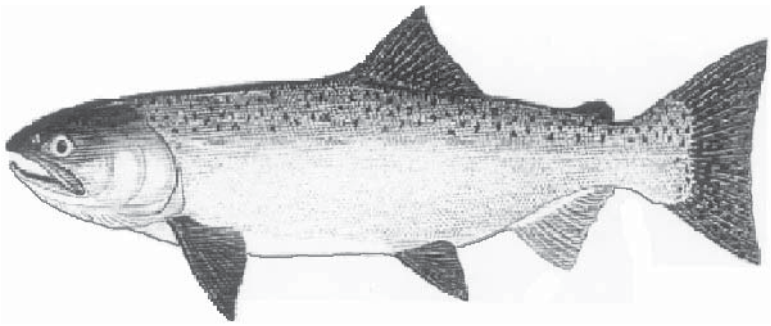


Diagram 2

Steelhead Trout

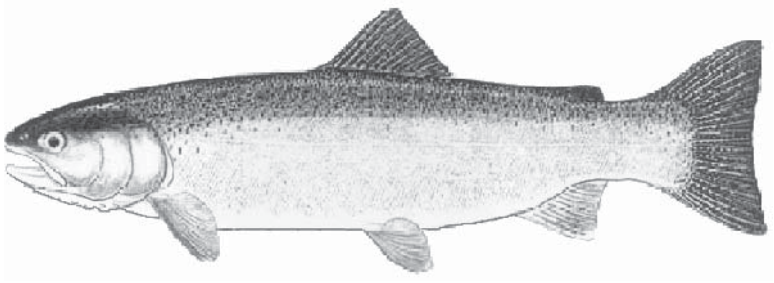


Diagram 3

Salmon & Steelhead Fact Sheet

CHINOOK SALMON
Oncorhynchus tshawytscha

Chinook salmon (also called king salmon) are anadromous fish that live in the cold water of the Pacific Ocean north from California and the streams flowing into it. When they are in the ocean, Chinook are silvery in color with a bluish or gray back and large, blotchy, black spots. Commercial salmon fishing provides jobs for many people, from catching fish to processing it for retail sales. The salmon from the American River watershed swim to the ocean through San Francisco Bay and stay within 70 miles of the coast of California.

After two to six years in the ocean, adult salmon return to their home streams to spawn (the process of reproduction). In California, most are three years old. Returning Chinook turn dark in color. The males often become red and develop a hooked jaw. They spawn in river gravels containing rocks up to 6 inches across. Chinook salmon always die after spawning.

Most young Chinook start migrating to the ocean shortly after hatching. Salmon migrate to the ocean unless they are landlocked; that is, trapped in water that does not flow to the ocean.

The largest Chinook salmon caught weighed 135 pounds. In California, the average fish weigh from 12 to 17 pounds and are 2 to 2.5

STEELHEAD TROUT
Oncorhynchus mykiss

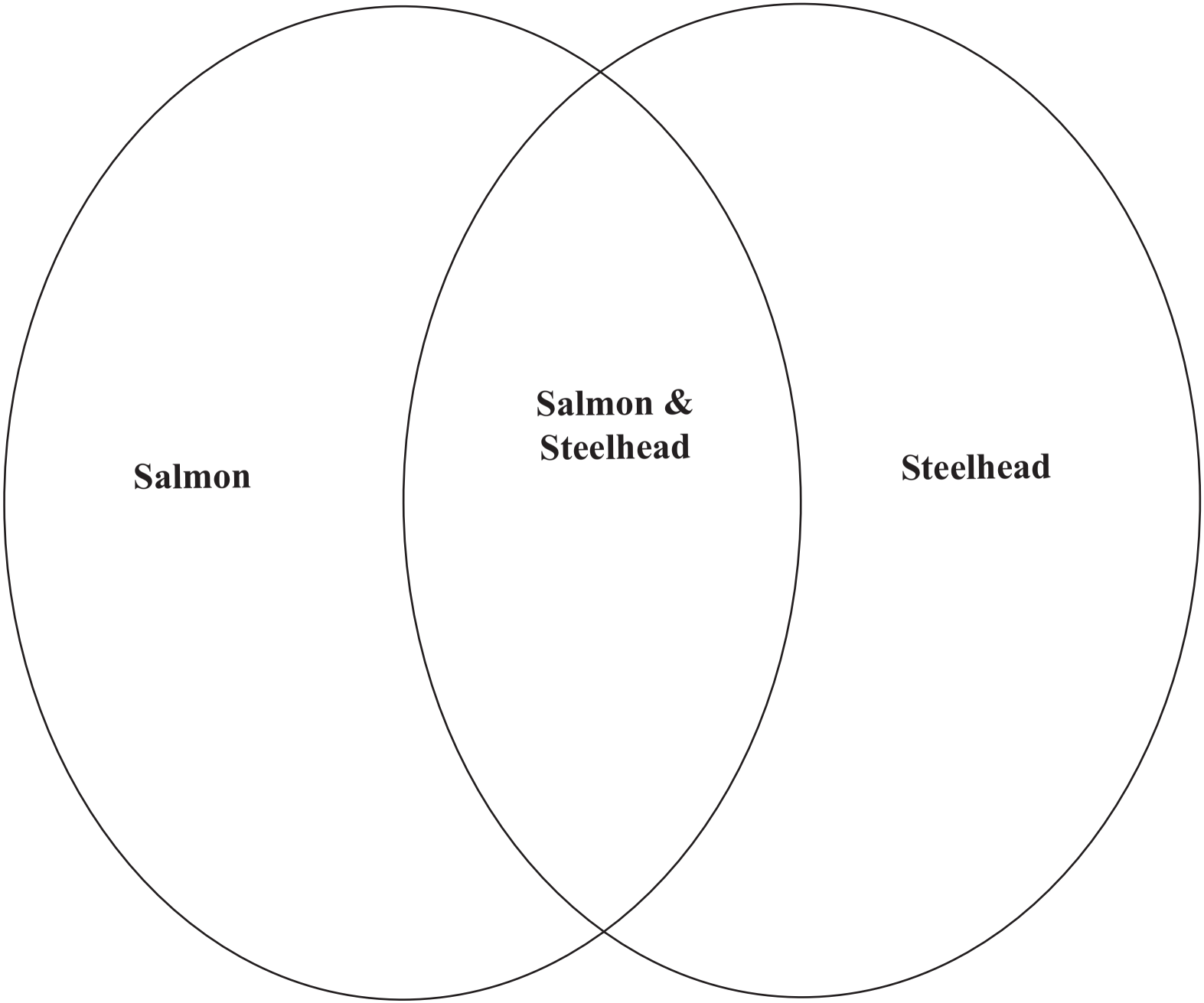
Steelhead trout are anadromous fish that live in the Pacific Ocean and the streams flowing into northern California. When they are in the ocean, steelhead are silvery with a bluish back and have many small, black dots on their back, head, and tail. Since steelhead are rarely caught in the ocean, it is a mystery where they go while in the ocean.

After two to four years in the ocean, adult steelhead return to their home streams to spawn (the process of reproduction). Their colors become more like the colors of freshwater rainbow trout. They have a green back, pink stripes on their sides, and a silver belly. The males are brighter and have a hooked jaw. They look for clean, small gravel in which to spawn.

Steelhead may spawn two to four times during their life. They swim back to the ocean and stay there two years before returning to spawn again. Before migrating to the ocean, young steelhead stay in fresh water one to two years (sometimes longer). Some never migrate. These are called rainbow trout.

Although the largest steelhead caught weighed 42 pounds, most weigh around 5 to 10 pounds and are about 2 feet long. After a steelhead has spawned the first time, it does not get much larger.

Venn Diagram



Salmon & Steelhead Game

This game is played like Joseph Cornell's "Owls and Crows." The large group is divided into two, and these two groups face each other approximately eight feet apart. Place boundary lines behind each group approximately 20 feet back. The leader stands at the end of the two lines and reads a true or false question. If the question is true, the salmon chase the steelhead across the back boundary line behind the steelhead, trying to tag the steelhead. If the question is false, the steelhead chase the salmon across the boundary line behind the salmon trying to tag the salmon. All participants should only use one hand in tagging. If a participant in the opposite group is tagged then they move over to that group. After everyone lines up again, another question is read and

Questions:

1. Salmon and steelhead can climb ladders.
2. Steelhead are rainbow trout that go to sea.
3. A fish's body is just right for flying.
4. Salmon lay their eggs in swimming pools.
5. Baby salmon carry lunch bags in their fins to eat from.
6. The word for fish which are hatched in fresh water, but migrate to salt water are called anadromous fish.
7. Another name for King salmon is Prince salmon.
8. Steelhead return to the ocean after spawning.
9. Chinook salmon can grow to be 10 feet long.
10. Salmon use their ears to hear their way back to the river where they hatched.
11. Chinook can weigh up to 100 pounds.
12. Another name for King salmon is Chinook salmon.
13. Steelhead return to their home stream to spawn.
14. Female salmon dig their nest with a shovel.
15. Keeping streams and rivers clean and cool help young salmon survive.
16. Steelhead are often caught in the ocean.
17. Salmon have fins to help them swim.
18. The river that we are nearest to in which the Chinook return to is called the Mississippi.
19. Clean, cold water kills salmon.
20. Steelhead in freshwater are colored much like the rainbow trout.
21. Fish are warm blooded.
22. Salmon have teeth.

Answers:

1. True
2. True
3. False. Fish live in water and they swim.
4. False. They lay their eggs in gravel nests called redds.
5. False. Baby salmon have a yolk sac that provides nourishment.
6. True
7. False. The other name is Chinook salmon.
8. True
9. False. They average about 2 to 2.5 feet in length.
10. False. Salmon use their sense of smell.
11. True
12. True
13. True
14. False. Female salmon use their tail and body.
15. True
16. False. Steelhead are seldom caught in the ocean.
17. True
18. False. The river is the American River.
19. False. Salmon need clean, cold water to live.
20. True
21. False. Fish are cold blooded.
22. True
23. False. Steelhead are smaller then Chinook.

Adapted from Joseph Cornell's activity and written by Beth Etgen from Effie Yeaw Nature Center.

Finger

Five Kinds of Pacific Salmon for Early Childhood Education and pre K-2

Objective
Students will identify five kinds of Pacific salmon.

Curricular Areas
Science, Language Arts, Art, and Math

California Content Standards
Science
K Number 1.0
Math
K Number 1.0
English Language Arts
K Listening/Speaking 1.0, 2.0
1st Listening/Speaking 1.0, 2.0
2nd Listening/Speaking 1.0, 2.0

Method
Students will use their fingers to help them learn the names of Pacific salmon, and using a color key, they will color salmon drawings.

Materials
- Time to complete: (1) 50-minute class period
- Coloring utensils
- Copies of the five salmon page
- Enlarged copies of the Chinook salmon
- Tissue paper
- Stapler
- String

Background
Salmon are fish born in freshwater. They live in their birth river for several months and then swim to the ocean to live their adult life. When it is time for salmon to spawn (lay their eggs), they migrate back to the river where they were born.

Five kinds of salmon live in rivers along the Pacific coast: the Chinook (or king), the coho (or silver), the sockeye (or red), pink (or humpback), and the chum (or dog). Chinook are the biggest. Some Chinook can weigh over 100 pounds. Pink salmon are the smallest, usually weighing between 3 to 5 pounds.

Procedure
1. Ask students how many have ever seen a salmon. Ask students what they know about salmon. Have they ever eaten salmon? Do they know something that salmon do that makes them very different from most other fish?
2. Read *The Salmon* by Paula Z. Hogan or *Salmon Stream* by Carol Reed-Jones.
3. Explain that there are five kinds of Pacific salmon. Name the five kinds: Chinook, sockeye, coho, chum, and pink.
4. Tell students there is a fun way they can learn and remember the kinds of Pacific salmon by using their fingers.
   - Have students hold up one hand
   - The thumb will be the chum (notice the rhyme)
   - The pointer will be the sockeye
   - The big finger is the Chinook because it is the biggest salmon
   - The ring finger is the coho
   - Of course, the pinky is the pink salmon, which is the smallest salmon

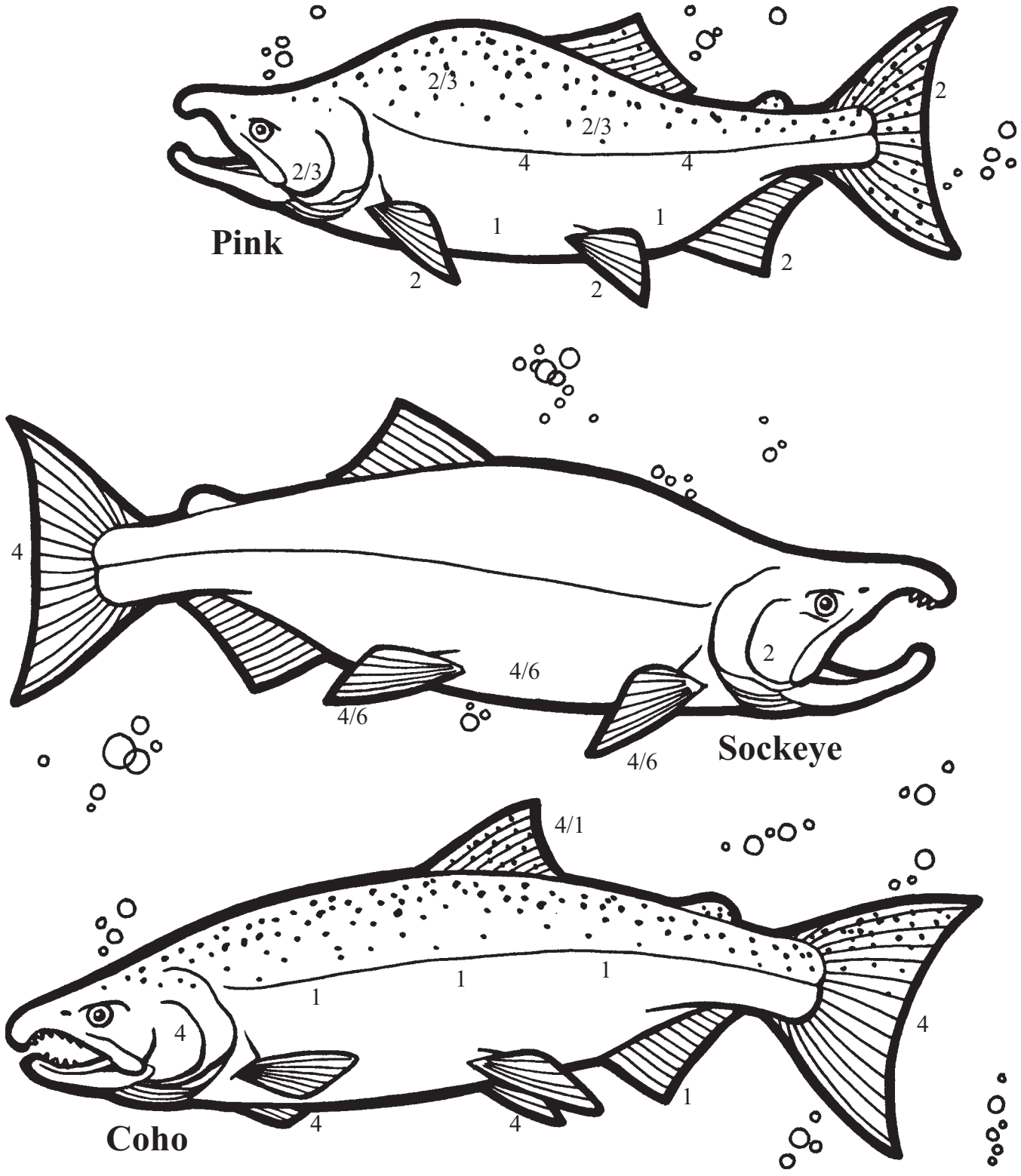
   Have student recite the names of the salmon using their fingers as they say the name.
5. Pass out copies of *Color the Fish!* color page and color key. Instruct students to color the fish using the color key.

Extensions
1. Explain that Chinook is the salmon in the American River. Ask students what they remember about the Chinook? (It is the biggest salmon). To create a three-dimensional Chinook, enlarge the drawing from the color page. Students can color and cut out the copy (double the paper to create two sides). Place the two cut-out fish together and staple the perimeter edges, leaving an opening large enough to stuff crumpled tissue paper into the interior, and staple closed. Attach string to hang fish.

Evaluation

Adapted from an activity by Beth Etgen from Effie Yewn Nature Center.

Color the Fish!



Fish drawn by Gary Whitley from the *Pacific Salmon and Steelhead Coloring Book,* published by the U.S. Fish and Wildlife Service, Pacific Region.